

In the Claims

Amend claims 1, 7-12, 14-15, 20-21 and 27-28 to read as follows:

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1. (Once Amended) A method for varying a direction of a light beam passing through a micro-machined device, said method comprising
directing said light beam through a transparent membrane separating two refractive regions, each of said refractive regions comprising a fluid with a different refractive index, said membrane being attached at its perimeter to a fixed member; and,
inducing a deformation of said membrane, thereby increasing a thickness of a first one of said refractive regions and correspondingly decreasing a thickness of a second one of said refractive regions.
 7. (Once Amended) A method as in claim 4, wherein said membrane is one of a plurality of substantially identical membranes fabricated on one contiguous section of silicon wafer and each one of said plurality of membranes is capable of being deformed independently of any other one of said plurality of membranes.
 8. (Once Amended) A method as in claim 7, wherein more than one of said plurality of membranes are in contact with a single body of refractive liquid.
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 9. (Once Amended) A method as in claim 1, comprising controlling the direction of the light beam passing through the micro-machined device using a feedback method.
 10. (Once Amended) A method as in claim 9, wherein said feedback method comprises generating a signal indicative of one or more of: the direction of the light beam passing through the micro-machined device, an amount of said deformation, an amount of electrostatic force between said membrane and an electrode on said fixed member, and an amount of electrical capacitance between said membrane and said electrode.

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11. (Once Amended) A method as in claim 10, wherein said feedback method comprises linearization of the deformation of said membrane.

12. (Once Amended) A method as in claim 11, wherein said linearization comprises using data from a look-up table.

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14. (Once Amended) An adaptive lens in a micro-machined device, said adaptive lens comprising a deformable transparent membrane separating two refractive regions, each of said refractive regions comprising a fluid with a different refractive index, wherein an amount of deformation of said transparent membrane determines an amount of refraction caused to a light beam transmitted by said adaptive lens.

15. (Once Amended) An adaptive lens as in claim 14, wherein deformation of said membrane is induced by electrostatic force.

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20. (Once Amended) An adaptive lens as in claim 14, wherein said deformable transparent membrane is one of a plurality of substantially identical membranes fabricated on one contiguous section of silicon wafer and each one of said plurality of membranes is capable of being deformed independently of any other one of said plurality of membranes.

21. (Once Amended) An adaptive lens as in claim 20, wherein more than one of said plurality of membranes are in contact with a single body of refractive liquid.

27. (Once Amended) An adaptive lens as in claim 22 wherein said degree of refraction is controlled via a feedback mechanism.

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28. (Once Amended) An adaptive lens as in claim 27, wherein said feedback mechanism comprises a feedback sensor, which indicates one or more of: said degree of refraction, an amount of said curvature, an amount of

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electrostatic force between said membrane and an electrode on said fixed member, and an amount of electrical capacitance between said membrane and said electrode.

Add new claims 32-65 as follows:

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32. (New) A micro-electromechanical adaptive lens comprising a deformable transparent membrane attached at its perimeter to a substrate, wherein an amount of deformation of the membrane determines an amount of refraction of a light beam transmitted through the adaptive lens.
 33. (New) An adaptive lens according to claim 32, wherein the membrane extends over a cavity in the substrate and, when deformed, the membrane curves into the cavity.
 34. (New) An adaptive lens according to claim 33, wherein the membrane separates a first region and a second region, each of the first and second regions comprising a fluid with a different refractive index.
 35. (New) An adaptive lens according to claim 33, wherein the cavity contains a liquid which has a refractive index different than that of a fluid on an opposing side of the membrane.
 36. (New) An adaptive lens according to claim 33 comprising an electrode located in a vicinity of the membrane, wherein the amount of deformation of the membrane is dependent on a magnitude of an electric field applied between the electrode and the membrane.
 37. (New) An adaptive lens according to claim 36, wherein the electrode is located inside the cavity.
 38. (New) An adaptive lens according to claim 37, wherein the electrode is substantially transparent.

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39. (New) An adaptive lens according to claim 36, wherein the membrane comprises a conductive layer and an insulating layer.
 40. (New) An adaptive lens according to claim 39, wherein the insulating layer is located between the electrode and the conductive layer.
 41. (New) An adaptive lens according to claim 36, wherein, when the magnitude of the electric field is zero, the membrane is substantially flat.
 42. (New) An adaptive lens according to claim 36, comprising a feedback unit, wherein the feedback unit is connected to receive a control signal indicative of a desired amount of refraction and at least one of: a measured value of the amount of refraction; a measured value of the amount of deformation; a measured value of the size of the electric field; and, a measured value of an amount of capacitance between the membrane and the electrode; and wherein the feedback unit is connected to output a signal that controls the magnitude of the electric field, to produce the desired amount of refraction.
 43. (New) An adaptive lens according to claim 42, wherein the feedback unit comprises a linearization module having at least one look-up table stored in a memory.
 44. (New) An adaptive lens according to claim 43, wherein the memory comprises memory cells on the substrate.
 45. (New) An adaptive lens according to claim 32, wherein the membrane is under tensile stress.
 46. (New) An adaptive lens according to claim 45, wherein the tensile stress is induced during fabrication of the membrane.
 47. (New) An adaptive lens according to claim 32, wherein the perimeter of the membrane is substantially circular.

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48. (New) A plurality of substantially similar adaptive lenses according to claim 32, each one of the adaptive lenses fabricated in a single substrate and comprising an independently deformable transparent membrane.
49. (New) A plurality of adaptive lenses according to claim 48, wherein the independently deformable transparent membranes extend over a single cavity in the substrate and, when deformed, each membrane curves into the cavity.
50. (New) A plurality of adaptive lenses according to claim 49, wherein the cavity contains a body of refractive liquid and each membrane is in contact with the body of refractive liquid.
51. (New) An adaptive lens according to claim 32, wherein the membrane separates a first region and a second region, each of the first and second regions comprising a fluid having a different refractive index.
52. (New) An adaptive lens according to claim 32 comprising an electrode located in a vicinity of the membrane, wherein the amount of deformation of the membrane is determined by an electric field applied between the electrode and the membrane.
53. (New) A method for varying an amount of refraction of a light beam transmitted by a micro-electromechanical adaptive lens, the method comprising:
providing a deformable transparent membrane, attached at its perimeter to a substrate; and
inducing a deformation of the membrane, wherein an amount of the deformation of the membrane determines the amount of refraction of the light beam transmitted by the adaptive lens.
54. (New) A method according to claim 53, wherein inducing a deformation of the membrane comprises curving the membrane into a cavity formed in the substrate.

55. (New) A method according to claim 54, wherein the membrane separates a first region and a second region, each of which comprises a fluid with a different refractive index, and wherein deforming the membrane comprises decreasing a thickness of the second region.
56. (New) A method according to claim 55, wherein the second region comprises a refractive liquid.
57. (New) A method according to claim 54, wherein inducing a deformation of the membrane comprises applying an electrostatic force to the membrane.
- a45 58. (New) A method according to claim 57, wherein the amount of deformation of the membrane is dependent on a magnitude of the electrostatic force.
59. (New) A method according to claim 58, wherein, when the magnitude of the electrostatic force is zero, the membrane is substantially flat.
60. (New) A method according to claim 58 comprising controlling the amount of refraction of the light beam by:
- receiving a control signal indicative of a desired amount of refraction;
 - measuring at least one measured value from among: the amount of refraction; the amount of deformation; the magnitude of the electrostatic force; and a capacitance associated with the electrostatic force;
 - generating an output signal that determines the magnitude of the electric field to produce the desired amount of refraction based on the control signal and the at least one measured value.
61. (New) A method according to claim 60 comprising linearizing the deformation of the membrane.

62. (New) A method according to claim 53 comprising maintaining the membrane under tensile stress.
63. (New) A method according to claim 53, wherein the membrane separates a first region and a second region, each of which comprises a fluid with a different refractive index, and wherein deforming the membrane comprises decreasing a thickness of the second region.
64. (New) A method according to claim 53, wherein inducing a deformation of the membrane comprises applying an electrostatic force to the membrane.
65. (New) An adaptive lens comprising a deformable transparent membrane spaced apart from a transparent base and a transparent liquid having an index of refraction different from that of a fluid on a side of the membrane away from the base, the liquid located between the membrane and the base.